The present invention relates to a vector for introducing a gene into a plant, which comprises:

a desired gene, wherein the desired gene is not a selectable marker gene, and

a plant hormone signal transduction gene as a selectable marker gene.

See Claim 1.

The present inventors have discovered that a plant hormone signal transduction gene can be used as the selectable marker gene in order to identify plants and plant tissue into which the desired gene is introduced. Using the plant hormone signal transduction gene as the selectable marker, the selection efficiency is dramatically improved.

The rejections of the claims under 35 U.S.C. §103(a) over European Patent No. 0 716 147 (EP '147) in view of Kakimoto et al. are respectfully traversed. These references fail to suggest the claimed vector.

EP '147 and U.S. Patent No. 5,965,791 (U.S. '791) appear to be part of the same patent family, i.e., each reference contains the same disclosure. Accordingly, these references will be discussed with citations to U.S. '791.

The applied rejection is U.S. '791 in view of Kakimoto et al. Therefore, in order for the rejection to be sustainable, the combination of the teachings of U.S. '791 and Kakimoto et al. must suggest the claimed vector. For the reasons set forth below, that combination fails to do so.

U.S. '791 describes a vector containing a desired gene and a morphological abnormality induction (MAI) gene as a selectable marker (see the abstract). As recognized by the Examiner, this reference fails to teach a vector containing a plant hormone signal transduction gene (see the Official Action dated July 5, 2001, at page 9, numbered paragraph 41).

Kakimoto et al. describe a vector in which CKI1, a plant hormone signal transduction gene, is the desired gene and an antibiotic resistance gene was used as the selectable marker gene (see page 983). This is evident from Nos. 5 and 6 in the References and Notes at page 985 of the reference. As described therein, a cytokinin-independent mutant which was obtained by introducing the desired CKI1 gene was obtained was selected using the resistance to the antibiotic hygromycin as a selectable marker.

In the Official Action dated June 21, 2002, at page 7, the Examiner states:

> The Examiner maintains that Kakimoto et al. Teach a vector comprising a desired gene **and** a plant hormone signal transduction gene as a selectable marker gene. The desired gene of Kakimoto et al. is thus NOT a plant hormone signal transduction gene, but rather any of the additional genes of the Ti plasmid into which the plant hormone signal transduction gene was cloned. [Emphasis in original.]

This characterization of Kakimoto et al. is, simply put, incorrect.

One reading that reference would conclude that the purpose of the vector described therein was to express CKI1. Therefore, that gene was the desired gene. Therefore, since CKI1 is not a selectable marker gene, Kakimoto et al. fail to disclose a plant hormone signal transduction gene as a selectable marker gene.

One reading Kakimoto et al. would also conclude that the "additional genes of the Ti plasmid into which the plant hormone signal transduction gene was cloned" were present to assist and direct the expression of CKI1., not that they were desired genes to be expressed. As discussed above, an antibiotic resistance gene was used as the selectable marker gene in the construct described by Kakimoto et al. Therefore, the reference fails to describe a vector comprising a plant hormone signal transduction gene as a selectable marker gene.

Thus, Kakimoto et al. fail to describe a vector containing (1) a desired gene which is not a plant hormone signal transduction gene and (2) a plant hormone signal transduction gene as a selectable marker gene.

U.S. '791 and Kakimoto et al., considered in combination, fail to suggest the claimed vector. The vectors described in these references fail to suggest a vector which contains a desired gene which is not a plant hormone signal transduction gene and a plant hormone signal transduction gene as a selectable marker gene. In Kakimoto et al. the desired gene is a plant hormone signal transduction gene, which is not a selectable marker gene. U.S. '791, as recognized by the Examiner, fails to teach a plant hormone signal transduction gene at all. The Examiner states at page 8 of the Official Action dated March 21, 2002, that the motivation comes from "the success of Kakimoto et al. In using a plant hormone signal transduction gene as a selectable marker gene in plants." However, as discussed above, a plant hormone signal transduction gene was not used as a selectable marker gene in Kakimoto et al. Rather, an antibiotic resistance gene was used as a selectable marker in that reference.

Based on the foregoing, U.S. '791 and Kakimoto et al., taken in combination, fail to suggest the claimed vector. Accordingly, the combined disclosures of these references fail to establish a prima facie case of obviousness.

Moreover, the experimental data set forth in the present specification is striking evidence of non-obviousness. The data demonstrate the unexpected effect that selection efficiency of gene-introduced tissue can be improved by selecting and using the plant hormone signal transduction gene as the selectable marker gene as compared to the vector described in U.S. '791 (see page 22, the first full paragraph; paragraph bridging pages 32 and 33; page 35, the first full paragraph, *etc.* in the present specification). For example, in

Examples 1 and 2, the *CKI1* gene is used as the selectable marker gene so that 100% desired gene (GUS gene)-introduced tissue is selected by using the morphology such as multiple buds as the index (see paragraph bridging pages 32 and 33; page 35, the first full paragraph in the present specification). On the other hand, in Comparative Examples 2 and 3 using only the *ipt* gene (plant hormone synthesis gene) as the selectable marker gene, the desired gene-introduced tissues are 14% and 0%, respectively, among the tissues selected using the morphology as the index (see pages 36 and 37 in the present specification). Therefore, the selection efficiency is much higher using the claimed vector as compared to the vector described in U.S. '791.

Based on the foregoing, Claims 1-13 are not obvious over U.S. '791 in view of Kakimoto et al. Accordingly, withdrawal of these grounds of rejection is respectfully requested.

The rejection of Claims 1-9 for obviousness-type double patenting over Claims 1, 2, and 4-7 of U.S. Patent No. 5,965,791 (U.S. '791) in view of Kakimoto et al. is respectfully traversed.

The claims of the present application are not obvious over Claims 1, 2, and 4-7 of U.S. '791 in view of Kakimoto et al. for the same reasons that the pending claims are not obvious over the complete disclosure of U.S. '791 and Kakimoto et al., as discussed above. Accordingly, withdrawal of this ground of rejection is respectfully requested.

The rejections of the claims under 35 U.S.C. §112, first paragraph, is respectfully traversed.

At page 2 of the Official Action dated March 21, 2002, the Examiner states:

> The specification does not set forth what specific structural features define the claimed vectors comprising plant hormone signal transduction genes as selectable marker genes."

However, page 10 of the present specification provides a detailed description of plant hormone signal transduction genes. In fact, several specific examples of such genes are provided. Just merely providing the names of these gene provides the required structural and functional description of these sequences because, as noted in the specification, these sequences are known in the literature. Thus, Applicants did have possession of the claimed invention at the time the present application was filed.

Regarding enablement, the present specification provides a detailed description of how to make and use the claimed vector. As discussed above, the present specification provides a detailed description of plant hormone signal transduction genes at page 10, including several specific examples of such genes. The working Examples of the application at pages 27-45 provide specific details regarding how to make the claimed vector and select the tissue introduced the desired gene contained in the vector. Based on these teachings, one skilled in the art can readily prepare and use other vectors within the scope of the claims. The amount of experimentation would not be undue. Since the amount of experimentation necessary would not be undue, the claims are enabled.

The Examiner asserts at page 5, lines 7-12 in the Office Action that, since the "degradation" of endogenous chemical substances is well known to be essential to the maintenance of homeostasis in all biological systems, the existence of a "detoxification" mechanism against proteins that mediate plant hormone signal transduction would be essential.

However, the Examiner is confusing the "degradation" with the "detoxification". That is, the "degradation" means that a chemical substance is chemically changed to have a lower molecular weight, whereas the "detoxification" means that a chemical substance is chemically modified to thereby disappear its toxicity. Accordingly, the "degradation" does

not always involve the "detoxification", and in the same manner, the "detoxification" does not always involve the "degradation". Therefore, the above Examiner's assertion is incorrect in this point.

The plant hormone signal transduction gene used in the present invention expresses in plant cells and produces a protein which mediate the signal transduction of plant hormone. The protein produced mediates the signal transduction either directly or by "degradation". In this point, one of ordinary skill in the art can easily understand that the protein is not subjected to "detoxification" in plant cells. As discussed in the previous response filed on January 7, 2002, the protein functions in the signal transduction pathway of plants, is indispensable for growth and differentiation of all plants, and is naturally destined to exist in common to various plant cells.

Based on the foregoing, the claims satisfy the requirements of 35 U.S.C. §112, first paragraph. Accordingly, withdrawal of these grounds of rejection is respectfully requested.

Applicants submit that the application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Norman F. Oblon
Attorney of Record
Registration No. 24,618

James J. Kelly, Ph.D.
Registration No. 41,504

22850

(703) 413-3000
Fax No.: (703)413-2220
I:\atty\JK\4859-0029-0.AMD2.wpd